REMARKS

Concerning the Examiner's objection to the drawings because the reference character 7 has been used in the description to designate both the inlet-side section (page 2, lines 27-28) and the particle filter coating (page 6, line 30), it is noted that the description on page 6, line 30 has been changed so that also here the "inlet side section" is designated by the numeral 7. Amendment to the drawings is therefore not necessary.

Also as requested by the Examiner, the description has been carefully reviewed and amended where it was felt that amendments were needed.

The Examiner has rejected claims 1 – 4 under 35 USC 102(b) as being anticipated by EP 835 684.

The Examiner has further rejected claims 1 – 2 under 35 USC 102(b) as being anticipated by Blanchard et al., FR 2 780 696 – corresponding to US 6 767 526..

Furthermore, the Examiner has rejected claims 1 – 2 under 35 USC 102(e) as being anticipated by Bruggemann et al. (2002/003301).

In addition, the Examiner has rejected claims 1 – 5 under 35 USC 102(e) as being anticipated by Hoffman et al. (2001/0052732).

Also, claims 1 – 2 have been provisionally rejected under 35 USC 1029e) as being anticipated by copending application No. 09/885626 by the inventor of the present application.

The Examiner has furthermore rejected claim 5 under 35 USC 103(a) as being unpatentable over EP 835 684 in view of Hoffman et al. (2001/0052232),

He has rejected claims 3 – 5 under 35 USC 103(a) as being unpatentable over Bruggemann et al. (2002/0033017) in view of Hoffman et al. (2001/0052232), and

He has provisionally rejected claims 3 – 5 under 35 USC 103(a) as being obvious over copending application No. 09/885,626.

In view of the many references cited, first, the invention as defined in claim 1 is explained and then the various references are examined as to their pertinence with regard to claim 1.

The present invention as defined in claim 1 resides in an exhaust gas cleaning unit including: a particle filter (2), a nitrogen oxide store (3) arranged upstream of the particle filter (2) for removing nitrogen oxides from the exhaust gas before the exhaust gas reaches the particle filter (2) and an oxidation catalytic converter arranged upstream of the NO_x store.

This arrangement is particularly devised for Diesel engines which, for the regeneration of the particle filters, are operated in intervals at an increased exhaust gas temperature as required for the removal of soot from the particle filter. During those periods, when the exhaust gas temperature is temporarily raised to substantially higher values for the regeneration of the particle (soot) filters, also nitrogen oxides, which have been temporarily stored in the nitrogen oxide store upstream of the particle filter, are released and assist in the regeneration of the particle filter utilizing nitrogen dioxide (NO_2) for oxidation of the soot. Furthermore, the occasionally necessary high temperature regeneration of the nitrogen oxide store for preventing its poisoning by sulfur which requires relatively high exhaust gas temperatures of typically 600 °C to 700 °C, can be accomplished at the same time together with the soot removal from the particle filter for which an exhaust gas temperature of 400° to 600°C is needed. With the oxide store arranged upstream of the particle filter and a natural temperature gradient present in the exhaust gas flow there is a natural temperature match between the NO_x store and the particle filter during the combined high temperature regeneration and the thermal exhaust gas energy can be utilized for both regeneration processes at the same time.

EP 835 684 concerns the maintaining of the operation of a catalytic converter (second catalyst), which may also form a nitrogen oxide store, by the removal of soot particles which may have been deposited thereon and which would detrimentally affect its catalytic action (column 1, lines 41 – 43). To this end nitrogen dioxide (NO_2) is utilized which oxidizes the soot particles deposited, the NO_2 being generated by the oxidation of nitrogen monoxide contained in the exhaust gas by means of an upstream oxidation catalytic converter (first catalyst) see column 1, line 57 to column 2, line 5). EP 835 684 therefore discloses a series arrangement of an oxidation catalytic converter and a nitrogen oxide storage device. The purpose of the second catalytic converter possibly in the form of a nitrogen oxide storage structure is to oxidize the components which can be oxidized (HC, CO, VOF) see col. 1, line 56 to column 2, line 3. This has nothing to do with a particle filter. In the arrangement according to the inven-

tion, the NO_x store arranged upstream of the particle filter is provided to remove NO_x from the exhaust gas (page 6, lines 15 -21) and the particle filter filters particles out of the exhaust gas (page 6, line 36 – page 7, line 3).

Reconsideration of the rejection of claims 1 and 3 and 4 which depend on claim 1under 35 USC 102(b) as being anticipated by EP 835 684 is respectfully requested.

US 6 767 526 concerns the removal of particles from the exhaust gas of an engine by means of a particle filter and the regeneration of the particle filter. For improving the oxidation, or, respectively, the burning of the soot particles deposited on the particle filter (particle filter regeneration), two procedures in combination are proposed. Firstly, by the addition of an additive (for example, EOLYS – see column 8, lines 60 – 67) the ignition temperature of the soot is lowered. The additive includes an SOC catalyst which is deposited finely divided on the soot particles in the particle filter and which acts as a soot inflammation promoter (col. 2, lines 65 – col. 3, lines 67).

Secondly, the NO_2 content in the exhaust gas is increased whereby the soot oxidation or incineration is further improved (col. 1, lines 36 – 44). Preferably, the NO_2 content is increased by means of a catalytic converter (conversion catalyst CC; col. 4, lines 22 – 31, lines 54 – 61) arranged upstream of the particle filter. This catalytic converter may include a nitrogen oxide store (col. 5, lines 59 – 67). Consequently, US 6 767 526 discloses a series arrangement of an upstream nitrogen oxide store and a downstream particle filter, but it does not disclose the provision of an additional oxidation catalytic converter arranged upstream of the NO_x store nor does it disclose, or in any way suggest, the arrangement of an additional oxidation catalytic converter downstream of the particle filter (Claim 3), whereby the effectiveness of the exhaust gas cleaning unit is greatly enhanced.

Reconsideration of the rejection of claim 1 under 35 USC 102(b) as being anticipated by US 6 767 526 (or respectively FR 2 780 096) is respectfully requested.

US 2001/0052232 has a publication date of 12/20/01, that is, it is a non-pre-published applications which however has a filing date earlier than the present application. Nevertheless, the priority date of the present application precedes the filing date of US 2001/0052232 A1, that is, it is not a "prior art" document.

In any case, it discloses an exhaust gas cleaning system with a particle filter and a nitrogen oxide store which may be arranged upstream of the particle filter. Furthermore, the exhaust gas cleaning system may include an oxidation catalyst which may be arranged between the nitrogen store and the particle filter, whereas, in the arrangement according to the present invention, the oxidation catalytic converter is arranged upstream of the particle filter.

It is noted that, to the superficial observer, the differences pointed out between the prior art arrangements and the present invention may appear to be minor but they are there and they provide for quite different results. The arrangement of the oxidation catalytic converter upstream of the NO_x store causes the exhaust gas to be heated before it enters the NO_x store particularly if the air mixture in the cylinders is enriched or additional fuel is injected into the exhaust gas during the regeneration of the particle filter in order to increase the exhaust gas temperature to the degree needed for the regeneration of the particle filter (and the NO_x store).

Reconsideration of the Examiner's rejection of claim 1 under 35 USC 102(e) as being anticipated by Hoffman et al. (2001/0052232) is respectfully requested.

US 2002/0033017 A1 is a non-pre-published applications assigned to the assignee of the present application. The arrangement does not include an oxidation catalyst so that arguments as submitted above would apply. A terminal disclaimer could be submitted in this case but this decision is postponed until after the Examiner has indicated that the present application is allowable.

None of the references cited by the examiner anticipates claim 1 as amended herein, that is none of the references discloses the arrangement wherein a particle filter is disposed in a Diesel engine exhaust system downstream of an NO_x store and an oxidizing catalytic converter is arranged in the exhaust gas system upstream of the oxidizing catalytic converter or downstream of the particle filter so that the NO_x store and the particle filter can both be regenerated at the same time by heating the exhaust gas to the appropriate temperature.

A combination of the cited references can therefore hardly lead to the arrangement as now claimed in claim 1. The design of an exhaust system effective for the particular application requires deep expert knowledge – in the present case for example a number of various experts have been working together in an effort to solve the problem of particulate emission of Diesel engines. To provide a filter for collecting the particles is a simple matter. The problem

is to effectively regenerate the filter which is easily clogged by the carbon particles in the exhaust gas of a Diesel engine. This problem has not been solved with conventional arrangements.

Concerning the rejection of claim 4 and the rejection of claim 5 under 35 USC 103(a) as being unpatentable over EP 835 684 in view of Hoffmann et al. (2001/005232) which discloses the use of lambda probes in controlling the purification system, it is noted that both claims depend on claim 1. Claims 4 and 5 were not considered to cover generally a coating for a certain function or, respectively the use of lambda probes in controlling purification systems, but they were considered to be particularly advantageous in connection with the exhaust gas cleaning unit as defined in claim 1. Claims 4 and 5, being dependent on claim 1, include all the features of claim 1 and therefore should be patentable together with claim 1.

Reconsideration of these claims is respectfully requested.

New claims 8 and 9 have been added in order to adequately cover in claim 8 an arrangement with combined sulfur and soot generation phases during which sulfur removal from the nitrogen oxide store and soot removal from the particle filter are accomplished in a linked procedure wherein the exhaust gas is heated in the oxidizing catalytic converter before reaching the NiO_x store for the removal of the sulfur and subsequently supplied – still sufficiently hot – to the particle filter for the combustion of the particles in the particle filter (see description page 3, lines 28 – 36) and in claim 9, the addition of fuel into the exhaust gas or the combustion gas in the engine to enrich the exhaust gas for increasing its temperature during the oxidation of the additional fuel in the oxidizing catalytic converter so that it reaches the temperature required for the regeneration of the NO_x store and subsequently the particle filter (page 9, lines 13 – 15 and lines 35 – 37).

Reconsideration of claims 1, 3, 4, 5, and consideration of claims 8 and 9 is respectfully requested and allowance of these claims is solicited.

Respectfully submitted,

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